REMARKS

This Amendment is in response to the Office Action dated July 29, 2005. Claim 17 has been amended to recite "BPA" crystallizer stage in the second instance to provide proper antecedent basis. Upon entry of this amendment, Claims 16 - 27 are pending and under consideration in this application.

Rejections under 35 U.S.C. § 103(a)

Claims 16 – 27 are rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over U.S. Patent no. 4,107,218 to Konrad *et al.* ("Konrad). Applicant respectfully traverses this rejection and submits that the claims are patentable over the cited reference.

To establish a proper prima facie case of obviousness, three criteria must be met. First, there must be some suggestion or motivation, either in the cited references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify or combine the cited reference relied upon by the Examiner to arrive at the claimed invention. Second, there must be a reasonable expectation that the suggested modification or combination would be successful. Finally, the prior art reference (or references when combined) must teach or suggest each and every limitation of the rejected claims. The teaching or suggestion to make the claimed modification or combination and the reasonable expectation of success must both be found in the prior art, and not based upon in the applicant's disclosure. M.P.E.P. §706.02.

Konrad is directed to a process for removing color bodies from a 4,4'-bisphenol-A recycle stream. In particular Konrad describes at column 1 lines 39 – 68, that by-products including highly colored compounds are formed in the mother liquor following the reaction. To prevent the gradual build up of these by-products to unacceptable levels, a portion of the mother liquor is often continuously drawn off or purged. In some processes the mother liquor is reclaimed, and phenol is recovered from the mother liquor and recycled back to the reactor.

Konrad teaches that there is an unavoidable loss of raw material when removing the color bodies impurities, and that an amount of raw material much greater than the proportion of color bodies must be removed in order to prevent the production of a discolored product. Konrad

states that means for selectively removing the color bodies from the 4,4'-bisphenol-A process stream and reducing the loss of raw material is desirable (see column 2, lines 23 – 30).

To address this problem, Konrad describes taking a portion of the mother liquor recycle stream and contacting it with an acidic cation exchange resin in an adsorption column under certain conditions to remove color bodies present in the mother liquor prior to recycling the mother liquor back to the reactor (see column 3, lines 30 – 35). Applicant respectfully submits that the entire teaching and motivation of Konrad is limited to removal of color bodies from the mother liquor in a way that minimizes the loss of raw product. No where does Konrad teach or reasonably suggest a system for producing Bisphenol-A wherein the composition of a product stream is selectively adjusted such that substantially pure Bisphenol-A crystals are produced directly upon crystallization, without prior adduct crystallization as recited in Applicant's claims.

The Examiner argues on page 3 of the Office Action that Konrad teaches a first unit *i.e.* a reactor to create bisphenol-A in solvent and that the outlet stream from the reactor is feed to a separator unit. The Examiner further states that the separator unit removes phenol from the stream and the outlet stream is then fed to a crystallizer where crystals are formed and removed from the solvent. The solvent is then recycled to the reactor. The Examiner then concludes that the sole difference between the instant claims and the prior art is the specific product. Applicant respectfully disagrees.

At column 3, lines 1 – 29 of Konrad, the process is described wherein the product stream flows from the reactor 12 to a dehydrator 14 where acetone, mercaptan promoter, water and some of the phenol are stripped from the product stream. The dehydrated product stream flows from the dehydrator 14 to a crystallizer 16 where 4,4'-bisphenol-A/phenol adduct crystals are precipitated by cooling.

Konrad does not teach or reasonably suggest a BPA crystallizer stage that produces substantially pure BPA crystals directly upon crystallization without prior adduct crystallization as recited in Applicant's claims. The Konrad process forms only adduct crystals. In fact, when it comes to forming the final BPA crystals, Konrad simply states: "The 4,4'-bisphenol-A product is recovered from the adduct crystals by known techniques (not shown)." see column 3, lines 13 – 15. These known techniques are the prior art techniques known in the late 1970's and

are consistent with the shortcomings of the prior art that require costly and cumbersome de-phenolation of the adduct as described in the background section of the subject application.

Konrad never contemplated a system that provides a BPA crystallizer that produces BPA crystals directly by selective control of the composition of the product stream as recited in Applicant's claims.

The Examiner suggests that it would be obvious to one of ordinary skill in the art to determine through routine experimentation the optimum, operable crystallizer conditions in Konrad in order to create a purer product. Applicant disagrees. First, it is not a purer product, but a different product. Konrad produces only the adduct upon crystallization. The system with BPA crystallizer stage as claimed in the instant application produces substantially pure BPA crystals directly. Second, even assuming *arguendo* that one would try to modify the crystallizer of Konrad to produce BPA crystals, significant, not routine, experimentation would be required, and such significant experimentation could only take place once one discovered the role of the ternary phase equilibrium relationship in the direct crystallization of BPA crystals.

Specifically, Konrad is silent on how one would even begin to directly crystallize BPA crystals. The prior art is silent on how to recover substantially pure BPA crystals from the reactor effluent stream directly, without prior crystallization of the adduct. As described in detail in the subject application to arrive at the claimed invention requires a through understanding of ternary phase equilibrium relationships between BPA, Phenol, and the solvent. Furthermore, a knowledge of how the phase behavior can be manipulated by controlling the solvent composition is required. No where does Konrad describe or suggest such principles.

Next, to develop a system to produce substantially pure BPA crystals upon crystallization, significant experimentation of many variables is required. For example, Tables 1 and 2 in the detailed description of the subject application show the possible compositions for the feed stream to the crystallization stage. Excluding reaction by-products and impurities, four components make up the feed stream. In order to control the composition of each of these components to a desired value such that BPA can be recovered upon crystallization, many process variables are available, as indicated in Table 3. These include, but are not limited to: the operation temperature, the Phenol to Acetone ratio at the reactor inlet, the per pass conversion in the reactor unit, the fraction of solvent recovered by the solvent recovery unit **24**, the fraction of

Phenol recovered by the partial Phenol removal unit **30**, and the fraction of Acetone solvent recycled back to the reactor. Thus, the number of possible combinations is very large and to fully test each of the variables in order to arrive at the desired result is not routine experimentation. Again, such experimentation would be quite daunting, if not impossible, without discovering the role of the ternary phase equilibrium relationship in the direct crystallization of BPA crystals.

Applicant respectfully submits that Konrad does not teach or reasonably suggest every limitation of the claimed invention.

The Examiner further suggests that the dehydration unit in Konrad could be modified to a unit to remove just phenol and then another unit for separation. Applicant respectfully disagrees.

Konrad does not teach the crystallization of substantially pure BPA crystals. Konrad only crystallizes adduct, and thus does not need to remove phenol in the system as described by Konrad. Konrads's purpose is entirely different, the dehydration unit of Konrad is intended to remove water.

Konrad's purpose and motivation are different from the subject application, and Applicant respectfully submits that one cannot be motivated by the teaching of Konrad to arrive at the claimed invention. Regarding the Examiner's suggestion of general motivation to exercise more control over the product, that alone without some guidance or suggestion in the prior art of how to do so, is an impermissible leap to make. Again as stated above, this is a complicated matter with many variables potentially affecting the outcome. The variables must first be understood and the relationship between the various variables tested before one can begin to consider the operable units and their configuration within a system. Further, the system configuration is interrelated – each unit and how it is coupled effects the whole – such that one cannot move one unit to a different relationship with the rest without significant impact on the entire system, all of which requires significant experimentation to determine

Applicant respectfully submits that a the claimed invention is patentable over the cited reference, either alone or in combination with the general motivation suggested by the Examiner.

Based on the foregoing, Applicant respectfully submits that the application is now in condition for allowance. If any matters can be resolved by telephone, the Examiner is invited to call the undersigned attorney at the telephone number listed below. The Commissioner is authorized to charge any additional fees to Deposit Account No. 50-2319 (Order No. A-71202/MSS (469332-20).

Respectfully submitted,

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